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(71) Applicant: ACTV, INC. [US/US]; 1270 Avenue of the Americas, Suite 2401, Rockefeller Center, New York, NY 10020 (US).

(72) Inventor: FREEMAN, Michael, J. ; ACTV, Inc., 1270 Avenue of the Americas, Suite 2401, Rockefeller Center, New York, NY 10020 (US).

(74) Agents: DALEY, Christopher, J.; Dorsey & Whitney, 1330 Connecticut Ave. N.W., Suite 200, Washington, DC 20036 (US) et al.

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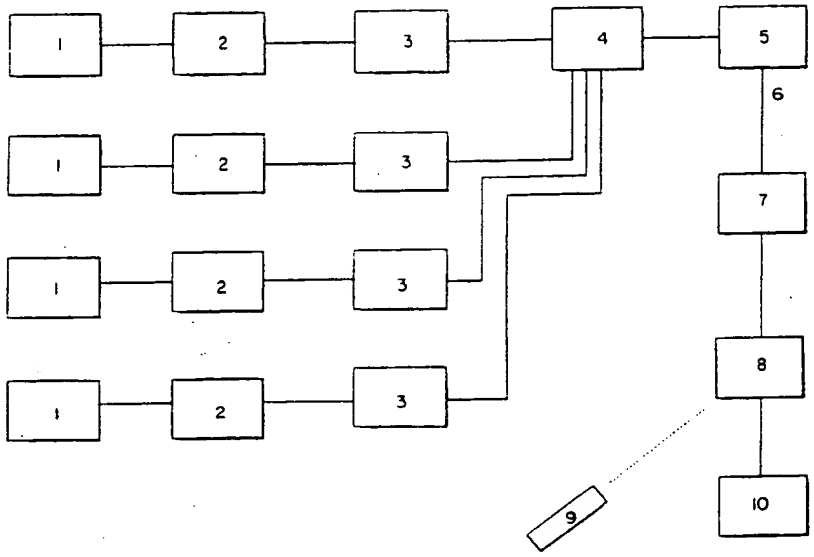
(54) Title: COMPRESSED DIGITAL DATA INTERACTIVE TELEVISION SYSTEM

(57) Abstract




An interactive cable television system is disclosed which utilizes a standard television cable distribution network (6) for simultaneously providing a plurality of viewers with an interactive television program comprising a plurality of signals related in time and content. The video signals are transmitted in a digital format (2), more than one signal being multiplexed (4) into a data stream for transmission of multiple signals over a single channel. The digital video signals may be compressed (3) for transmitting more video signals per channel. A receiver (7), in conjunction with a signal selector (8), selects a particular NTSC channel for playback, then selects a particular video signal from the multiplexed signal, and uncompresses the video signal for playback to a television monitor (10). An alternative embodiment is disclosed wherein the various signals which comprise the interactive program are switched between at the head end rather than at the receiver. The multiple choice control unit (9) selects a desired signal by relaying the multiple choice selections of the user through a relay box back to a remotely located switching station (4). The switching station routes the correct video signal down the appropriate cable channel for the particular user.

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# COMPRESSED DIGITAL DATA INTERACTIVE TELEVISION SYSTEM

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates generally to interactive response systems, and more particularly to an interactive television system which provides interactive programming using compressed, digital data having more than one video signal per broadcast channel, or a multiplexed signal within a digital format.

### 2. Description of the Prior Art

Interactive systems are well known in the art. By synchronizing parallel tracks of an information storage media, and relating the content of the various tracks, it was found that interactive activity could be simulated. For example, commonly owned Freeman, U.S. Patent No. 3,947,972 discloses the use of a time synchronized multi-track audio tape to store educational conversations. One track is employed to relay educational interrogatories to a user, and the remainder of the tracks, selectable by a switching mechanism, are used to convey responsive messages.

These systems progressed to interactive television, wherein multiple broadcast or cable channels were switched responsive to user selections to provide interactive operation. Commonly owned Freeman, U.S. Patent No. 4,847,700 discloses an interactive television system wherein a common video signal is synched to a plurality of audio channels to provide content related to user selectable responses.

Commonly owned Freeman, U.S. Patent No. 4,264,925 discloses the use of a conventional cable television system to develop an interactive system. Standard television channels with time synchronized content are broadcast to a plurality of users. Each user switches between channels responsive to interrogatories to provide interactivity.

These systems have been tailored to include memory functions so that the system can be more interactive, individually responsive, and so that customized messages may be given to the various categories of users responsive to informational queries. Freeman, U.S. Patent No. 4,602,279 discloses the use of a memory to store demographic profiles of television viewers. This information is stored to be recalled later for providing target specific advertising, for example.

These prior art interactive television systems were generally concerned with providing one signal (i.e. one video signal) per channel, whether the channel is on cable television, broadcast television, of VCR. Because cable and broadcast television channel capacity is becoming more limited as more and more cable channels are being utilized for conventional programming, and these systems require multiple channels, it would be desirable to reduce the channel capacity required for such systems while still providing at least the same level of interactivity. These disadvantages of the prior art are overcome by the present invention which provides an interactive television system which employs multiple, time-synchronized, content-related video signals per broadcast channel.

## SUMMARY OF THE INVENTION

The present invention is an interactive cable television system which utilizes digital video signals to provide customized viewing responsive to user selections. A standard cable or direct broadcast satellite television distribution network is utilized for transmitting the interactive and other programming to users. The present invention allows plurality of viewers to be simultaneously provided with a plurality of different program information message signals related in time and content to each other. The interactive program comprises a plurality of video signals related in time and content to one another.

The video signals are converted into digital format for transmission. In a digital format, it is possible to transmit more than one video signal per cable television channel. Further, it is possible to transmit video signals via conventional telephone lines. If desired, the various digital video signals may be compressed before transmission. Compression allows an even larger number of video signal to be transmitted over a channel of the transmission media. A multiplexer combines the various digital signals into a reduced number of transmission data streams for transmission. The various NTSC television channels may be allocated in a predetermined fashion to maximize the number of simultaneously transmittable signals. The multiplexer in conjunction with the cable television transmission system multiplexes the desired video signals onto the desired channels, and transmits these signals over the NTSC channels. The number of video signals which may be multiplexed onto a single transmission channel will vary depending on the video signals to be transmitted. The television

channels containing multiplexed video signals are transmitted over a standard cable television distribution network, or direct broadcast satellite transmission system. A receiver receives the various television channels, some or all containing multiplexed or non-multiplexed digital video signals, and in conjunction with a signal selector, selects a particular channel for playback, then selects a particular video signal from the multiplexed signal, and finally expands the video signal, if necessary, for playback to a television monitor.

A multiple choice controller operates to control the receiver and signal selector to select a particular video signal for playback. The multiple choice controller may be programmed to map the different cable television channels, and the multiple signals thereon, to a serial numerical channel representation to simplify use by the user. The signal selector includes the necessary expansion apparatus corresponding with the compression scheme in use.

In practice, a user selects a desired interactive program to be viewed by selecting a cable or direct broadcast satellite television channel having multiplexed video thereon. using the multiple choice controller, the user selectably switches between the related video signals on the selected channel responsive to information displays or interrogatory messages, the signal selector de-multiplexing, expanding and displaying the selected signal.

If more signals were needed for an interactive program than were mappable to a single channel, the signal selector in conjunction with receiver may be programmed to switch between the various video signals as well as the various broadcast channels to provide the necessary level of interactivity.

The various information segments in the various video signals relate in real-time and content so that an interactive conversation can occur as the video signal is played back and the user responds to the various interrogatories on the video signals. The use of multiple signals per channel may be used for many types of interactive programs, including those disclosed in the previously mentioned U.S. Patents, for example, field synchronized multiple camera angles from a sporting event, or an interactive game show.

In a two-way embodiment, the various signals which comprise the interactive program are switched between at the head end rather than at the receiver. This embodiment may be used for example in a cable television system, a

direct broadcast satellite system, a conventional telephone system modified to receive digital video signals, or any other appropriate transmission system capable of sending digital video signals. The multiple choice control unit, rather than selecting a desired signal from the a group of incoming signals, selects a desired signal by relaying the multiple choice selections of the user through a relay box back to a remotely located switching station, preferably the cable television source. The multiple choice selections may be relayed to the switching station in any conventional means, such as two-way cable television, telephone, or FM transmission. If the interactive programming is being transmitted over a telephone line, the multiple choice selections may be relayed back over the same telephone line. The switching station receives the multiple choice selection of the user and routes the correct signal down the appropriate cable channel, telephone line, or other transmission media for the particular user. In such an arrangement, only a single link is required between the subscriber or receiver and the head end so that the one channel link can be used to receive a plurality of different channel selections dependent on the interactive choice relayed from the receiver to the video switch at the head end.

If desired, the two-way link may be used for other purposes, such as to transmit user demographic data back to the programming source for commercial reasons, or to allow an interactive game show player to win prizes, for example.

The system of the present invention allows improved performance by the compression algorithms in use. When a channel change has been requested by the user, a slight imperceptible delay is programmed to allow the expansion algorithm an opportunity to adjust to the rapid change from one video signal to another.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a block diagram of the Interactive Television System of the present invention.

FIGURE 2 is a block diagram of the system of the present invention in a two-way transmission configuration.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is an interactive television system in which a plurality of viewers are simultaneously provided with a plurality of different program information message signals related in time and content to each other.

Preferably at a remote location from the viewer, a plurality of video signals 1 are provided, all related in time and content to one another. Video signals 1 may be, for example, various field and audio synchronized camera angles of a sporting event, or a game show having a content and host acting responsively to user selections. Alternatively, video signals 1 may be any video signals suitable for interactive conversation, such as those described in U.S. Patent Nos. 4,847,700, 3,947,972, 4,602,279, 4,264,925, 4,264,924, for example, the contents of which are incorporated specifically herein by reference. However, it is readily foreseen that various types of time and content related video signals exist which are suitable for interactive operation.

In previous systems, these various signals would be transmitted to a receiver on separate channels, each requiring for example, a separate 6 Mhz NTSC channel, assuming the system is an NTSC system although any type of television transmission, such as PAL, etc. may be employed if desired. By the present invention, video signals 1 are directed to analog-to-digital ("A/D") convertors 2 which convert the various video signals into digital format for transmission. A/D convertors 2 may be of any conventional type for converting analog signals to digital format. It is readily foreseen that an A/D convertor may not be needed for each video signal 1, but rather fewer convertors, or even a single convertor might be capable of digitizing the various video signals 1. It is further foreseen that interactive video programs might be delivered to a cable or other distribution network in pre-digitized and/or precompressed format. In a digital format, it is possible to transmit the various video signals over fewer transmission channels than if the video were in analog format.

The digital conversion results in very large amounts of data. It may therefore be desirable to reduce the amount of data to be sent, allowing thereby more signals to be sent over a single transmission channel. For example, a single frame of NTSC video represents over 350 Kbytes of data. Therefore, two hours of standard video is about 80 Gbytes. Since there are 30 frames/sec in such video, the data transfer rate is 22 Mbytes/sec. Such large amounts of data are difficult to process using current computer technology. However, it is foreseen that rapid advances in computerization will eventually permit reception of video at data rates sufficiently high to allow reception of uncompressed or expanded video in household systems.

In order to reduce the data transfer requirements, the various digital video signals may be compressed before transmission. The video may be compressed by any conventional compression algorithm, the two most common being "processor intensive" and "memory intensive."

The processor intensive approach performs compression by eliminating non-changing aspects of a picture from the processing in the frame-to-frame transfer of information, and through other manipulations of picture information involving mathematical computations that determine the degree to which a given motion or other in a picture is perceptible to the human eye. This approach depends on high-speed processing power at the transmission point.

The memory approach involves division of a picture frame into hundreds of minuscule blocks of pixels, where each block is given a code representing its set of colors and variations in luminance. The code, which is a much smaller increment of information than all the information that would describe a given block of the picture, is transmitted to the receiver. There, it calls up the identically coded block from a library of blocks stored in the memory of the receiver.

Thus, the bit stream represents a much smaller portion of the picture information in this approach. This system is generally limited by the variety of picture blocks which may be stored in the receiver, which relates directly to memory size and microprocessor power.

Data Compressors 3 are provided to reduce the data for each video signal which must be transmitted. Data compressors 3 may be of any conventional type commonly known in the art for compressing video images, such as those previously described. It is foreseen that compression of the various video signals might be done with fewer data compressors 3 than one compressor per video signal. In a conventional analog NTSC system, by way of example, it is possible to transmit one video signal per 6 MHZ channel. By digitizing the video signal, it is possible to send more than one video signal per channel. Compressing the digitized signals, allows even more video signals to be transmitted over a single transmission channel. The number of signals which may be sent over a single channel is generally related to, for example, a) the type of video being sent; b) the video compression scheme in use; and c) the current state-of-the-art in computer and memory power; and d) the bandwidth of the transmission channel.

Compression techniques exploit the fact that in moving images there is very little change from frame-to-frame. Editing out the redundancies between frames and coding just the changes allows much higher compression rates. The type of video which normally contains a great deal of high-speed movement, such as occurs at live sporting events, will, therefore, have the lowest compression rates. Movies, on the other hand, which normally have a lower frame rate and less frame-to-frame change than a line sporting event will achieve higher compression rates. Currently, compression can be varied from 2:1 to 10:1 for satellites, and 2:1 to 5:1 for cable television systems, depending on the degree of motion. However, it is readily foreseen that compression techniques will improve in the future to provide larger compression rates. It is further foreseeable that computer speeds may increase to a level of performance which will allow uncompressed or expanded video to be transmitted at more than one signal per channel.

Once the various video signals 1 have been digitized and compressed, multiplexer 4 combines the various digital signals into a reduced number of transmission data streams for transmission. For example, if 68 NTSC channels are available, and each channel is capable of transmitting either 4 digitized, compressed slow moving video signals (e.g. movies) or 2 digitized, compressed, high-speed video signals (e.g. sports) then the various NTSC channels must be allocated in a predetermined fashion to maximize the number of simultaneously transmittable signals. Multiplexer 4 receives the incoming compressed, digitized video signals and in a predetermined conventional fashion, in conjunction with transmitter 5, multiplexes the desired video signal onto the desired channels, and transmits these signals over the NTSC channels. It is readily foreseen that certain NTSC channels will contain only one video or other signal, in analog or digital form.

As indicated earlier, the number of video signals which may be multiplexed onto a single transmission channel will vary. The transmission data stream is transmitted by transmitter 4 via transmission media 6 to a receiving station 7. The transmitter 4, media 6, and receiver 7 may be any conventional means for transmitting digital video signals including broadcast television, cable television, direct broadcast satellite, fiber optic, or any other transmission means. The transmission means may even be a telephone system capable of transmitting a digital video data stream. Thus, a multiplexed data stream having several channels

may be sent directly to a user over a single telephone line. It is readily foreseen that the aforementioned digital transmission devices may include means for transmitting analog signals as well.

In a preferred embodiment, the digital transmission signal is preferably transmitted via cable television. Receiver 7, receives the various NTSC channels, some or all containing multiplexed or non-multiplexed digital video signals. Ordinarily, more than one channel will be transmitted by transmitter 5 and received by receiver 7 as in an ordinary cable television system. However, each of the different channels may have several digitized video signals thereon. Therefore, receiver 7 preferably operates in conjunction with signal selector 8 to select a particular NTSC channel for playback, to select a particular video signal from the multiplexed signa and finally to uncompress or expand the compressed video signal, if necessary for playback to monitor 10.

Multiple choice controller 9 operates to control receiver 7 and signal selector 8 to select a particular video signal for playback. In practice, a user need not know that multiple signals per channel are in use. If, for example, 68 channels with 4 signals-per-channel were in use, controller 9, in conjunction with receiver 7 and signal selector 8 might be programmed to represent these channels to the user as channels 1272. Output 10 is for example a conventional television. Signal selector 8 preferably includes a conventional de-multiplexer for selecting a particular signal from the channel currently being received by receiver 7. Signal selector 8 further includes the necessary un-compression or expansion apparatus corresponding with the compression scheme in use by compressors 3.

In practice, a user would select a desired interactive program to be viewed by selecting a cable television station or direct broadcast satellite station having multiplexed video thereon. Using multiple choice controller 9, the user selectably switches between the related video signals on the selected channel channels responsive to information displays or interrogatory messages, signal selector de-multiplexing, uncompressing or expanding and displaying the selected signal.

For example, an interactive sporting event program might be transmitted on a 6 MHZ cable television signal using a compression-multiplexing scheme which allows two sports channels to be transmitted over a single NTSC channel. It might be desired to have four video signals for the particular interactive sporting event. A

first video signal might contain the standard broadcast signal of the game; the second signal might contain a close-up view of the game action; a third signal might contain a continuously updated replay of game highlights; the fourth signal might contain statistical information. These four video signals might for example be multiplexed as follows: signals one and two multiplexed onto cable channel 34; signals three and four multiplexed onto cable channel 35. These four signals might, however, be mapped by controller 9 to playback as channels 78, 79, 80, and 81 for the user. Each video signal of this interactive program might then includes a label which reads, for example, "Full-Screen Action -- Press 78: Close-up Action --Press 79: Replay – Press 80: Statistics -- Press 81."

As shown, if more signals were needed for an interactive program than were mappable to a single channel, signal selector 8 in conjunction with receiver 7 may be programmed to switch between the various video signals 1 as well as the various broadcast channels to provide the necessary level of interactivity.

The multiplexed interactive program might be transmitted over a single telephone line, if desired. In this embodiment, multiple choice controller 9 would be programmed to switch between the various video signals on the single telephone line. If additional channels were desired, a two-way configuration might be used as described below.

The system of the present invention may be utilized in an educational embodiment. Information is stored on each video signal in a plurality of reproducible information segments, each of which comprises a complete message reproducible by the receiver directly in response to the selection of the video signal by signal selector 8 responsive to a user selection on multiple choice controller 9. Each of the information segments in the various video signals 1 contain interrogatory messages with associated multiple choice responses, responsive messages, informational messages, or combinations thereof. The messages contained in the various video signals 1 may include responsive messages, informational messages, interrogatory messages or combination thereof whose contents are related in real-time to particular interrogatory messages, and correspond to the multiple choice selectable responses to the particular interrogatory messages.

The various information segments in the various video signals relate in real-time and content so that an interactive conversation can occur as the video signal is played back and the child responds to the various interrogatories contained in the video signals. As a child answers a particular interrogatory with a multiple choice response, the information in the video signal associated with the particular selection is played back by the signal selector 7. In the selected video signal at the time at which the selection occurred, is an information segment whose content corresponds with the selected response to the previous interrogatory, whether or not the interrogatory was in the same video signal as the information segment being output. The various interrogatories, responsive messages, and informational messages may generally be contained in any or all of the various video signals provided that they are synchronized properly so as to retain a timed relationship, and correspond properly a decision tree logic.

The use of multiple signals per channel may be used for many types of interactive programs, preferably those disclosed in the previously mentioned U.S. Patents. It is readily foreseen that other interactive programs may be developed which are within the scope of the present invention.

As shown in FIG. 2, the system of the present invention may be operated in a two-way configuration. In this mode, the various video signals 1 are processed as previously described, being digitized by A/D convertor 2 and compressed by video compressors 3. The signals are then routed to a central switching station 4. In this embodiment, the switching between the various video signals is accomplished at the head end rather than at the receiver. Multiple choice control unit 9 relays the multiple choice selections of the user through a relay box 7 back to the remotely located switching station 4. The multiple choice selections may be relayed by relay box 7 to the switching station via any conventional means, such as two-way cable television, telephone, or FM transmission, for example. Switching station 4 receives the multiple choice selection of the user and routes the desired signal to transmitter 5 which conventionally transmits the desired video signal down the appropriate cable channel for the particular user. If desired, transmitter 5 may also transfer conventional programming on the cable television channels not being used for interactive programming. Alternatively, switching station 4 may include multiplexing equipment as previously described, and thus operate multiple

interactive or noninteractive programs over a single television channel. However, a very large processing capability would be needed to operate in such a configuration.

For example, if it were desired to implement the interactive football game program as previously described, a single NTSC cable channel might be allocated for the program. However, in this instance, the four video signals would be present at the transmitting end. In response to a signal from wireless controller 9, a signal is sent by relay box 7 to the cable TV switching station which routes the desired video signal to the requesting viewer. Such a system requires very fast switching equipment, but is readily foreseeable using digital imagery.

Alternatively, it might be desirable to transmit the interactive sporting event over a single telephone line. When the user enters a selection on controller 9, a signal is sent via the telephone line to the central switching station which routes the desired signal of the interactive program over the user's telephone line so that a single link handles both the interactive choice being made at the receiver and the transmission of that choice, out of a plurality of choices, from the head end where the actual switching takes place in response to the interactive selection made at the receiver.

The two-way link between the user and the switching station may be used for other purposes. For example, demographic data may be transferred from the user to the broadcast network for commercial purposes, bills may be paid, a game show winner may be sent a prize, or other commercial or non-commercial purpose may be achieved.

As previously described, compression systems generally perform less efficiently when frame-to-frame content includes many changes in pixel content; i.e. during fast motion, or scenery changes. The system of the present invention may be advantageously programmed to ease the processing burden on the uncompression program. When a key on the controller is depressed to select a desired signal, a slight imperceptible delay might be effectuated if desired. This delay would allow the uncompression or expansion algorithm a short period of time to adjust to the rapid change from one video signal to another which ordinarily causes a degradation in its efficiency. Utilizing this delay, it may be possible to increase the number of signals which may be transmitted per channel.

Although the present invention has been described in detail with respect to certain embodiments and examples, variations and modifications exist which are within the scope of the present invention as defined in the following claims.

What is claimed is:

1. In an improved interactive television system having:

a plurality of television reception systems (7,10), each of said television reception systems (7,10) comprising a television receiver (7), each of said television receivers (7) having a plurality of different television reception channels, each of said television reception channels having a different communication frequency; and,

a television programming transmission means (5) for substantially simultaneously providing a multi-information television program signal to said television reception systems (7,10), said multi-information television program signal comprising a plurality of simultaneously provided different information signals (1) each related in real time and content to each other;

wherein the improvement comprises:

said information signals (1) being in a digital format, and

each of said plurality of information signals (1) having a communication frequency corresponding with one of said plurality of different television reception channels, more than one of said information signals (1) being capable of having the same communication frequency and being combined into a multiplexed program signal with at least one other of said more than one of said information signals (1), said more than one information signals (1) in the multiplexed program signal being substantially simultaneously transmittable;

any of said different television reception channels being capable of carrying a single information signal or a multiplexed program signal;

each of said television receivers (7) being capable of independently selectably receiving any of said plurality of information signals (1), each of said television receivers (7) comprising (i) a multichannel selection means (8) for selecting the television reception channel frequency to be received, and (ii) signal selection means (8) for selecting a particular information signal from the multiplexed program signal, each of said information signals (1) having a numerical channel representation in said multichannel selection means (8);

at least one of said information signals (1) further comprising video information displayable on said television receiver (7) corresponding to informational labels to be dynamically assigned to said numerical channel

representations for a particular multi-information television program, said television displayable informational labels being dynamically variable dependent on the content of said multi-information television program,

whereby flexible multi-information television programming may be provided with a reduced number of television channels.

2. An improved interactive cable television system according to claim 1 wherein said information signals (1) comprise a plurality of successive information segments, and at least a portion of said plurality of said information segments on said plurality of information signals (1) being content related in a decision tree relationship between successive individual segments and between information signals (1) whereby a stored accumulation program format may be received as said selectable multi-information television programming.

3. An improved interactive television according to claim 1 wherein said television programming transmission means (5) further comprising means for substantially simultaneously providing at least one regular broadcast television signal, having a communication frequency, to said television reception systems (7,10) on said frequency, said television receivers (7) being capable of receiving said at least one regular broadcast signal on a channel corresponding with said frequency.

4. An improved interactive television system according to claim 3 wherein said multiplexed program signal further comprises at least one regular broadcast television signal.

5. An improved interactive television system according to claim 1 wherein said television programming transmission means (5) provides said multi-information television program signal to said television reception system by means of a one way television signal distribution network (6).

6. An interactive television system having a plurality of television reception systems (7,10), each of said television reception systems (7,10) having a television receiver (7), each of said television receivers (7) having at least one television reception channel, each of said at least one television reception channels having a different communication frequency,

a television distribution network (6) for distributing television programming to said plurality of television reception systems, and

a television transmission means (5) operatively connected to said distribution network (6) for providing said television programming to said plurality of television reception systems (7,10), said television transmission means (5) for providing a multi-information television program signal as said television programming to said television reception systems, said interactive television system comprising:

multiplexing means (4), coupled to said transmission means (5), for providing a multiplexed multi-information television program signal;

digitizing means (2), coupled to said multiplexing means (4), for digitizing a plurality of multi-information segments, each multi-information segment comprising a plurality of simultaneously provided different information signals (1) related in real time and content to each other, multiplexed (4) at a communication frequency so as to become said multiplexed multi-information television program signal which may be substantially simultaneously reproducible;

each of said television receivers (7) being capable of independently selectably receiving information on any one of said at least one television reception channel dependent on the television reception channel selected;

said television reception systems further comprising a multi-information selection means (8,9) coupled between said distribution network (6) and said television receiver (7), said multi-information selection means (8,9) comprising signal selection means (8) coupled to said subscriber distribution network (6) for demultiplexing said multiplexed multi-information television program signal and selectively providing an output signal comprising only one of said related different information signals (1) for regenerating said output signal on said television receiver (7,10) in said one television reception system;

whereby viewers in said television system may independently selectably view any of said simultaneously provided different information signals, said multi-information television programming being received on a multiplexed reception channel.

7. An interactive television system according to claim 6 wherein said television programming further comprises a plurality of different regular television program signals along with said multiplexed multi-information television program signal, each of said different regular television program signals having a

communication frequency, more than one of said regular television program signals being capable of having the same communication frequency, each of said different regular television program signals being capable of being multiplexed with said at least a portion of said information signals (1), each of said different regular television program signals being directly selectably receivable by said signal selection means (8) and displayable on a corresponding television reception channel.

8. An interactive television system according to claim 6 wherein said distribution network (6) being selected from the group consisting of cable television, telephone, broadcast television, and direct broadcast satellite.

9. An interactive television system according to claim 6 wherein said selection means (8,9) comprises keyboard means (9) comprising a plurality of keys for selectably enabling converting of any one of said associated frequencies of said simultaneously provided different information signals (1) into said television reception channel associated frequencies dependent on the key selected.

10. An interactive television system according to claim 9 wherein said multi-information segments comprise video information displayable on said television receiver (7) corresponding to information labels to be dynamically assigned to said keys for a particular multi-information segment, said television displayable information labels being dynamically variable dependent on the content of said particular multi-informational segment.

11. An interactive television system according to claims 6 or 10 wherein at least a portion of said plurality of said information segments on said plurality of information signals (1) being content related in a decision tree relationship between successive individual segments and between information signals (1) whereby a stored accumulation program format may be received as said selectable multi-information television programming.

12. An interactive television system according to claim 6 wherein at least at least two of said simultaneously provided different information signals (1) comprise different field synchronized camera angles of the same event.

13. In an improved interactive television system having a plurality of television reception systems, each of said television reception systems comprising a television receiver (7), each of said television receivers (7) having a plurality of

different television reception channels, each of said television reception channels having a different communication frequency;

a television distribution network (6) for distributing television programming to said plurality of television reception systems; and

a television transmission means (5) operatively connected to said distribution network (6) for providing television programming to said plurality of television reception systems (7,10), said television programming transmission means (5) having means for substantially simultaneously providing a multi-information television program signal as said television programming to said television reception systems;

said multi-information television program signal comprising a plurality of simultaneously provided different information signals (1) related in real time and content to each other;

wherein the improvement comprises:

digitizing means (2), for digitizing said plurality of simultaneously provided different information signals (1);

switching means (4), coupled between said digitizing means and said transmission means (5), for selecting one of said plurality of simultaneously provided different information signals (1) responsive to a control signal corresponding to a particular television receiver for transmitting said selected signal to said particular television receiver, said control signal being received over a transmission media;

each of said television receivers (7) being capable of independently selectably receiving any of said plurality of information signals (1) dependent on the television reception channel selected,

each of said television receivers (7) comprising a selection means (8) for selecting the television reception channel associated frequency to be received, and

signal selection means (7,8) for generating and transmitting said control signal to said distribution network (6) for signalling said switching means (4) to transmit a particular information signal from said plurality of information signals (1) to said television receiver (7),

whereby flexible multi-information television programming may be provided with a reduced number of television channels.

14. An improved interactive television system according to claim 13 wherein said information signals (1) comprise a plurality of successive information segments, and at least a portion of said plurality of said information segments on said plurality of information signals (1) being content related in a decision tree relationship between successive individual segments and between information signals (1) whereby a stored accumulation program format may be received as said selectable multi-information television programming.

15. An improved interactive television according to claim 13 wherein said transmitted television programming further comprises at least one regular broadcast television signal having a communication frequency, said television programming transmission means (5) further comprising means for substantially simultaneously providing said at least one regular broadcast television signal to said distribution network (6) on said communication frequency, said television receivers (7) being capable of receiving said at least one regular broadcast signal on a channel corresponding with said frequency.

16. An improved interactive television system according to claim 13 wherein said distribution network (6) being selected from the group consisting of two-way cable television, two-way telephone, and two-way direct broadcast satellite.

17. An improved interactive television system according to claim 13 wherein said control signal transmission media being selected from the group consisting of telephone, cable television, FM transmission, and fiber-optic.

18. An improved interactive television system according to claims 13 or 14 wherein each of said information signals (1) having a numerical channel representation in said multichannel selection means;

at least one of said information signals (1) further comprising video information displayable on said multichannel television receiver (7) corresponding to informational labels to be dynamically assigned to said numerical channel representations for a particular multi-information television program, said television displayable informational labels being dynamically variable dependent on the content of a said multi-information television program.

19. An improved interactive television system according to claims 2, 11 or 14 wherein said displayable informational labels dynamically vary according to the successive decision tree selections to be made.

20. An improved interactive television system according to claims 1, 6 or 13 further comprising means (3), coupled to said transmission means, for compressing said digital information signals (1).

AMENDED CLAIMS

[received by the International Bureau on 23 April 1993(23.04.93); original claim 19 amended; other claims unchanged (1 page)]

14. An improved interactive television system according to claim 13 wherein said information signals (1) comprise a plurality of successive information segments, and at least a portion of said plurality of said information segments on said plurality of information signals (1) being content related in a decision tree relationship between successive individual segments and between information signals (1) whereby a stored accumulation program format may be received as said selectable multi-information television programming.

15. An improved interactive television according to claim 13 wherein said transmitted television programming further comprises at least one regular broadcast television signal having a communication frequency, said television programming transmission means (5) further comprising means for substantially simultaneously providing said at least one regular broadcast television signal to said distribution network (6) on said communication frequency, said television receivers (7) being capable of receiving said at least one regular broadcast signal on a channel corresponding with said frequency.

16. An improved interactive television system according to claim 13 wherein said distribution network (6) being selected from the group consisting of two-way cable television, two-way telephone, and two-way direct broadcast satellite.

17. An improved interactive television system according to claim 13 wherein said control signal transmission media being selected from the group consisting of telephone, cable television, FM transmission, and fiber-optic.

18. An improved interactive television system according to claims 13 or 14 wherein each of said information signals (1) having a numerical channel representation in said multichannel selection means;

at least one of said information signals (1) further comprising video information displayable on said multichannel television receiver (7) corresponding to informational labels to be dynamically assigned to said numerical channel representations for a particular multi-information television program, said television displayable informational labels being dynamically variable dependent on the content of a said multi-information television program.

19. An improved interactive television system according to claim 2 or 14 wherein said displayable informational labels dynamically vary according to the successive decision tree selections to be made.

## STATEMENT UNDER ARTICLE 19

Claim 19 has been amended in response to "Box I" of the International Search Report. "Box I" stated that claim 19 was not drafted in accordance with the second and third sentence of Rule 6.4(a). As originally filed, Claim 19, a multiple dependent claim, depended from claim 11 another multiple dependent claim. Claim 19 has been amended so that it no longer depends from claim 11. Applicant apologizes for any inconvenience this error may have caused.

Applicant requests acceptance of claim 19 and that the International Search Report be "established in respect of claim 19."

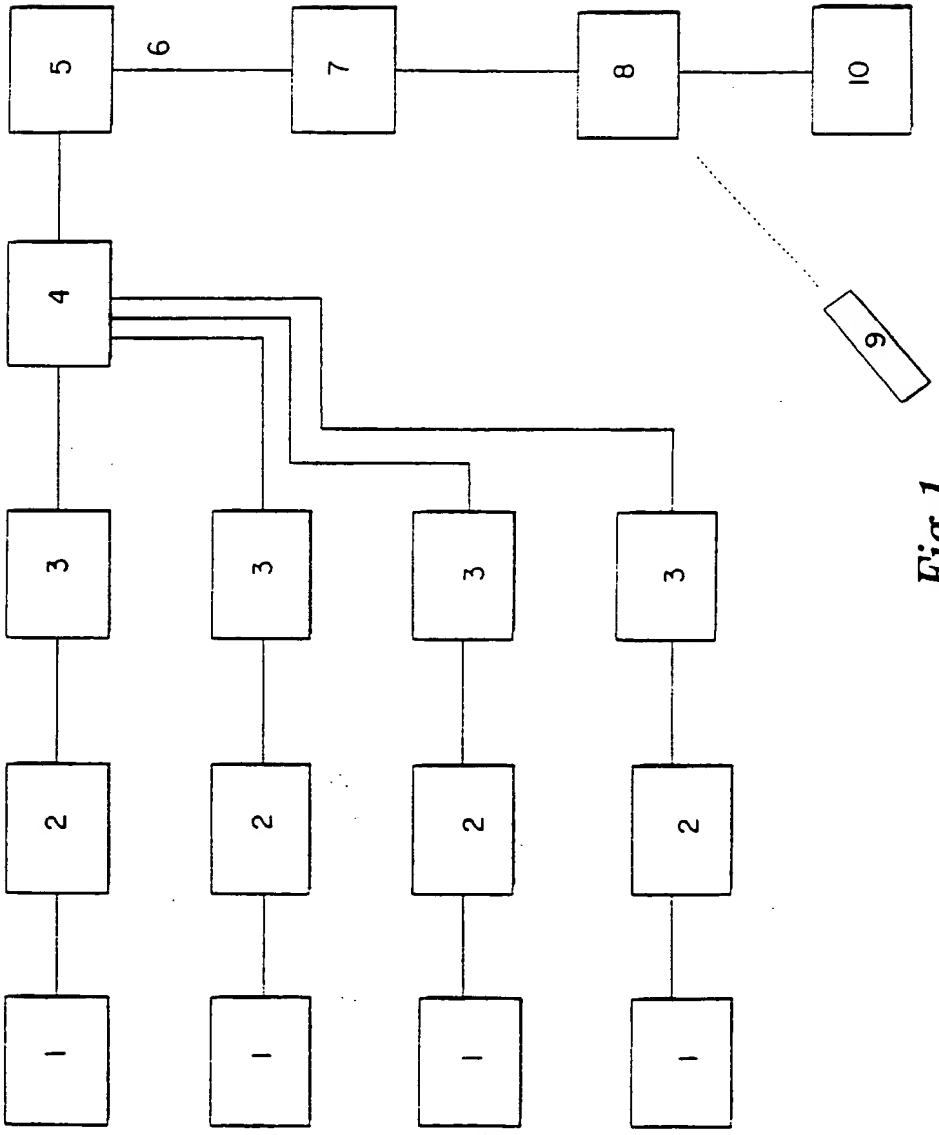


*Fig. 1*

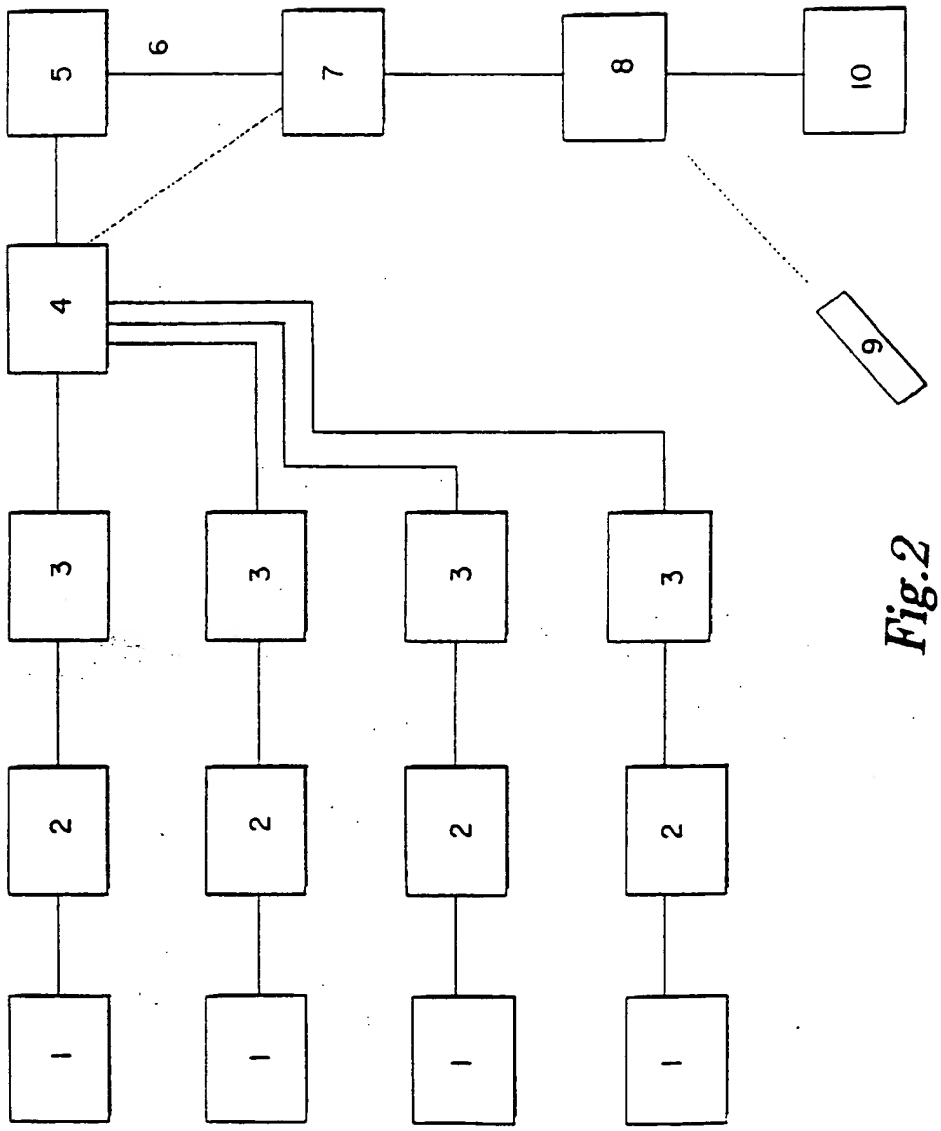


Fig.2

# INTERNATIONAL SEARCH REPORT

PCT/US92/09785

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :H04H 1/00
US CL :358/86; 455/3.1
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 455/4.1,4.2,5.1,6.1,6.2,6.3

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | US, A, 4,264,925 (FREEMAN ET AL.) 28 April 1981, See columns 2-3, fig. 1. | 1-18,20 |
| Y | US, A, 4,975,771 (KASSATLY) 04 December 1990, See columns 2-8, figs. 1,3,6,8. | 1-18,20 |
| A,P | US, A, 5,133,079 (BALLANTYNE ET AL.) 21 July 1992, See columns, 1-4, fig. 1B. | 1-18,20 |
| A | US, A, 4,264,924 (FREEMAN) 28 April 1981, See columns 2-6, fig. 1. | 1-18,20 |
| A,P | US, A, 5,132,992 (YURT ET AL.) 21 July 1992, See columns 1-3, fig. 2A. | 1-18,20 |

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

| | | | |
|---|---|---|---|
| * | Special categories of cited documents: | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "A" | document defining the general state of the art which is not considered to be part of particular relevance | "X" | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
| "E" | earlier document published on or after the international filing date | "Y" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "L" | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" | document member of the same patent family |
| "O" | document referring to an oral disclosure, use, exhibition or other means | | |
| "P" | document published prior to the international filing date but later than the priority date claimed | | |

| | |
|---|---|
| Date of the actual completion of the international search<br>07 JANUARY 1993 | Date of mailing of the international search report<br>25 FEB 1993 |
| Name and mailing address of the ISA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231<br>Facsimile No. NOT APPLICABLE | Authorized officer<br>for NGUYEN VO<br>Telephone No. (703) 305-4786 |

Form PCT/ISA/210 (second sheet)(July 1992)*